NOTE *Pathology*

Juvenile Malignant Mesothelioma in a Dog

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ABSTRACT. An 11-month-old male mixed breed dog was euthanized due to two months history of vomiting and anorexia. At necropsy, numerous, multifocal or coalescing, firm, protruding nodules, 5 to 40 mm in diameter were scattered throughout the mesentery and omentum. Histologically and immunohistochemically, the nodules were diagnosed as malignant mesothelioma. Metastasis to the regional mesenteric, mediastinal and tracheobronchial lymph nodes were observed.

KEY WORDS: canine, mesothelioma, neoplasia.

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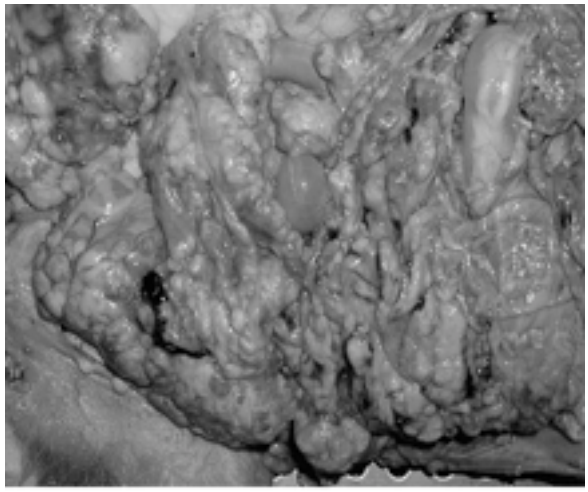
Mesotheliomas are neoplasms of the serous lining mesothelial cells of the abdominal, thoracic, and pleural cavities [4, 6]. Spontaneous malignant mesotheliomas are rare, but sporadic cases have been documented in various animal species [4, 6]. They occur most frequently as a congenital tumor in calves, but the age of onset is 4 to 13 years (mean 7.8 years) in canine [4]. Experimentally induced mesotheliomas have been reported in non-human primates and rodents following intratracheal exposure to asbestos fibers or cigarette smoke [2, 3]. Mesotheliomas in animals are divided into epithelial and sclerosing types based on the histologic patterns of the neoplasm [4, 6]. In the present report, we document a case of canine juvenile mesothelioma.

An 11-month-old female mixed breed dog was admitted to the Seoul National University Veterinary Teaching Hospital after two months history of intermittent vomiting, anorexia, and weight loss. Pleural effusion, ascites, and abdominal masses were revealed upon explorative laparotomy. Because of the poor prognosis, the dog was euthanized, and postmortem examination was performed.

At necropsy, the abdominal cavity contained a large amount of serosangineous fluid. Numerous, multifocal or often confluent, tan to white, firm, protruding nodules, 5 to 40 mm in diameter, were scattered throughout the mesentery, omentum, and serosal surfaces of the abdominal organs giving a characteristic velvety appearance (Fig. 1). Mesenteric lymph nodes were enlarged about two to four times their normal sizes. In pleural cavity, mediastinal and tracheobronchial lymph nodes were enlarged but no neoplastic nodule as seen in the abdominal cavity was found on pleural surface.

Tissue samples from the abdominal tumor nodules and representative tissue specimens were fixed in 10% phosphate-buffered formalin, routinely processed, and stained with hematoxylin and eosin (H&E) for light microscopic examination. Replicate sections of the tumor masses were



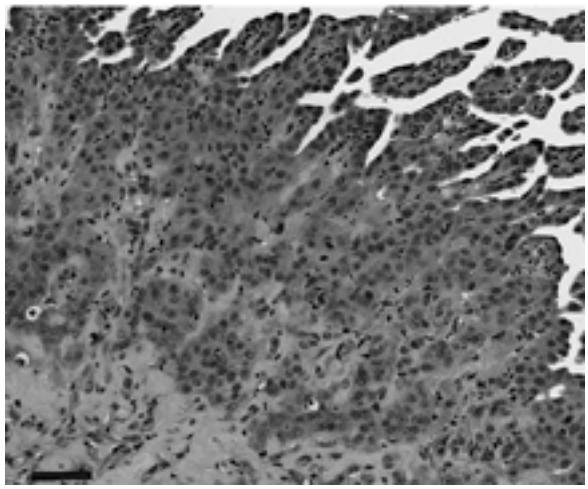


Fig. 1. The omentum was covered by multiple, often confluent nodules showing the velvety appearance.

Fig. 2. Mesenteric nodule. Note the papillary outgrowth of the neoplastic mesothelial cells. H&E. Bar=80 μm.

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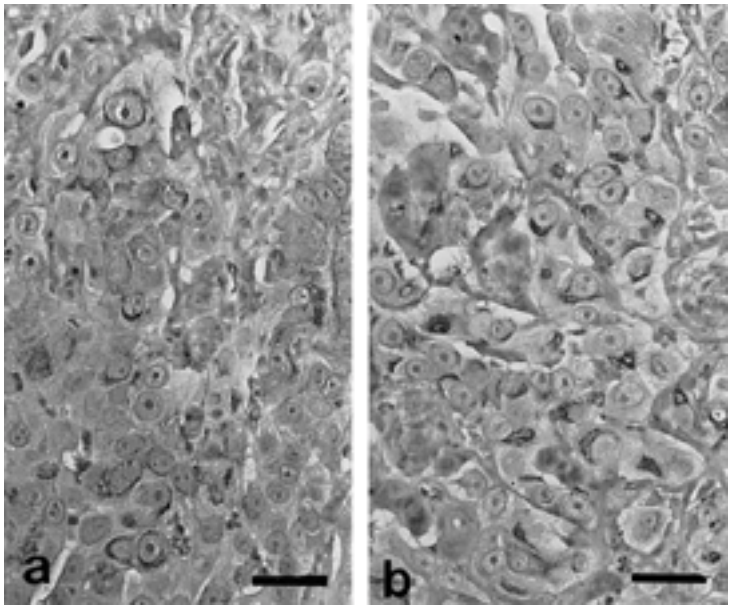

Fig. 3. Mesenteric nodule. Note the cytokeratin (a)- and vimentin (b)- positive tumor cells. ABC. Bar=55 μm.

mounted on Probe-On slides (Fisher Scientific, Pittsburgh, PA, U.S.A.) and used for immunohistochemical identification of cytokeratin and vimentin. After inhibiting endogenous peroxidase activity with methanol containing 3% H_2O_2, tissue sections were heated in 10 mM citrate buffer (pH 6.0) in a pressure cooker at 120°C for 6 min for antigen retrieval. The slides were then incubated at 4°C overnight with commercially available antibodies to cytokeratin and vimentin (Dako, Carpinteria, CA, U.S.A.) at 1:100 dilutions. The standard avidin-biotin-peroxidase (ABC) technique (Vector Lab, Burlingame, CA, U.S.A.) was used to demonstrate the antigen.

Histologically, the omental and mesenteric surfaces as well as serosa of the abdominal organs were markedly thickened due to multiple layers of neoplastic mesothelial cells showing papillary outgrowths that were well supported by fibrous connective tissue (Fig. 2). The neoplastic cells were cuboidal in shape and had round to oval, vesiculated nuclei with predominant nucleoli and a small to moderate amounts of cytoplasm, and occasionally form gland-like structure. Very few mitotic figures were observed. Single or clusters of neoplastic cells were also noted in the sinuses of the lymph nodes. Metastatic tumor nodules often compressed the cortex of the lymph nodes. No gross and histologic evidences of metastasis to any parenchymal organs other than to the regional lymph nodes were found. Immunohistochemically, the neoplastic cells were weakly to strongly positive for both cytokeratin (Fig. 3a) and vimentin (Fig. 3b).

Diagnosis of a malignant abdominal mesothelioma with metastases to the regional lymph nodes was made based on the characteristic gross, histopathological, and immunohistochemical finding. Histologically, epithelial-type mesothelioma should be differentiated from adenocarcinoma originating from other parenchymal organs such as mammary gland or prostate. Primary adenocarcinoma was not observed in any parenchymal organs examined and, thus, the possibility of a metastatic adenocarcinoma was ruled out in this case. Co-expression of cytokeratin and vimentin in neoplastic mesothelial cells has been reported in human mesotheliomas [1].

The cause of the present neoplasm in a juvenile dog remains to be determined. Unlike other species, the majority of bovine mesotheliomas generally occurs at a young age and is predominantly located in the abdominal cavity [4], indicating that factors other than asbestos might be associated with bovine mesotheliomagenesis. Only one case of juvenile mesothelioma was reported in a 7-week-old puppy, in which the genetic factor was suggested as the cause of neoplasm considering the age of the dog [5]. Strong association of asbestos fibers and mesothelioma has been documented in humans and animals [2,3]. However, asbestos fibers were not searched for in the present particular case because the dog had been kept indoors and no epidemiological evidence of asbestos exposure could be traced. More numerous cases should be needed for evaluating the incidence, cause, and biological behavior of canine mesotheliomas of young age.

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